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College of Hawaii Publications

COLLEGE BULLETIN

NUMBER 6

SECOND ANNUAL REPORT
OF THE
Department of Agriculture
For the Fiscal Year Ending June 30, 1919

By

L. A. HENKE

Professor of Agriculture



HONOLULU:
PUBLISHED BY THE COLLEGE
DECEMBER, 1919



*Report of the
1918-1919*

INTRODUCTORY.

This second annual report of the Department of Agriculture of the College of Hawaii covers the fiscal year from July 1, 1918, to June 30, 1919. Previous data concerning the College Farm can be found in Bulletin number five of the College of Hawaii.

The College of Hawaii has no agricultural experiment station, and no funds for research work, or men detailed thereto. The results and data included in this report are a by-product of College teaching, and necessarily fragmentary and in many cases incomplete.

GROUNDS AND BUILDINGS.

Land: About sixty acres of the College land located between the College Buildings and the Manoa stream have been reserved for the Farm, and about one-third of this has been sufficiently cleared to grow crops. The balance is in pastures and unimproved lands. A plan of permanent and definite fields, each 293.1 by 148.6 feet (one acre) has been inaugurated on the improved part of the farm and will greatly facilitate the keeping of records.

Irrigation: A twelve-inch irrigation line from the Manoa stream, with five-inch lateral branches, provides water for most of the fields now in irrigation.

Buildings: These consist of a piggery, milking shed, dairy, horse stable, feeding barn for cattle, tool house, poultry house, two machine sheds and four cottages for farm laborers.

Livestock: The College has a herd of fine dairy animals of both the Holstein and Guernsey breeds, Tamworth and Berkshire hogs, and four work horses.

Poultry: The poultry department was started in February, 1919, with one dozen Plymouth Rock fowls.

Machinery: The College Farm is well equipped with the usual lines of farm machinery, including one caterpillar tractor.

SUMMARY OF INVENTORY

June 30, 1919

Department of Agriculture, College of Hawaii

BUILDINGS:

| | | |
|-------------------------------|------------|-------------|
| Old Dairy Building | \$1,053.00 | |
| Four Laborers' Cottages | 1,568.60 | |
| Field Tool Sheds | 291.60 | |
| Piggery | 2,417.70 | |
| Milk Buildings | 2,785.60 | |
| Horse Stable | 336.05 | |
| Poultry Building | 117.10 | \$ 8,569.65 |

| | | |
|------------------|--|----------|
| FARM ROADS | | 1,477.50 |
|------------------|--|----------|

| | | |
|-------------------------|--|----------|
| IRRIGATION SYSTEM | | 2,862.00 |
|-------------------------|--|----------|

DAIRY:

| | | |
|-------------------------------|------------|----------|
| Holsteins | \$3,525.00 | |
| Guernseys | 1,850.00 | |
| Dairy Machinery | 703.00 | |
| General Dairy Equipment | 178.12 | 6,256.12 |

DRAFT ANIMALS:

| | | |
|-------------------------|-----------|----------|
| Horses | \$ 950.00 | |
| General Equipment | 55.80 | 1,005.80 |

SWINE:

| | | |
|-------------------------|-----------|--------|
| Berkshires | \$ 390.00 | |
| Tamworths | 310.00 | |
| General Equipment | 34.00 | 734.00 |

POULTRY:

| | | |
|-------------------------|----------|-------|
| Plymouth Rocks | \$ 45.00 | |
| General Equipment | 43.43 | 88.43 |

FARM IMPLEMENTS AND TOOLS:

| | | |
|---------------------------------------|------------|----------|
| Field Machines | \$1,737.30 | |
| Motors, Feed Cutters, etc. | 640.50 | |
| General Farm Equipment and Tools..... | 83.36 | 2,461.16 |

| | | |
|----------------------------|--|-------------|
| Total Farm Inventory | | \$23,454.66 |
|----------------------------|--|-------------|

| | | |
|---|--|--------|
| Materials and Apparatus used solely for instructional work in laboratories | | 535.56 |
|---|--|--------|

| | | |
|-------------------|--|-------------|
| GRAND TOTAL | | \$23,990.22 |
|-------------------|--|-------------|

RAINFALL ON COLLEGE FARM.

A rainfall gauge is located on the west side of the College Farm at a ground elevation of 79.5 feet. The following table shows the monthly rainfall since the rain gauge was installed:

| | 1918. | 1919. |
|-----------------|-------------|-------------|
| January | 6.67 inches | 4.75 inches |
| February | 4.77 " | .98 " |
| March | 7.38 " | 2.23 " |
| April | 9.17 " | .99 " |
| May | 1.33 " | 2.08 " |
| June | 1.98 " | 1.83 " |
| July | .48 " | |
| August | Record lost | |
| September | 1.00 inches | |
| October | 3.31 " | |
| November | 5.34 " | |
| December | 6.33 " | |

ALFALFA.

Alfalfa continues to be a most valuable crop on the College Farm and furnishes the bulk of the roughage fed to the cattle and hogs, and in the form of cured hay to the horses. We do not like to feed green alfalfa in large quantities to working horses, as it is rather too laxative in its action, especially when cut before flowering. The same is true to a lesser extent when fed to cattle, but we avoid any difficulty along this line by feeding sudan grass, sorghums, or sweet potato vines, in the green state, along with the green alfalfa.

The alfalfa fields on the College Farm, some of which are now over three years old, continue to give big yields except in a few fields where the rows were too close to permit cultivation, and in these "nut grass" (*Cyperus rotundus*) has produced such a sod-bound condition that the fields are being plowed and planted to other crops. Alfalfa on the College Farm is planted in rows thirty inches apart and cultivated and irrigated when necessary. The abundance of weeds, especially the above-mentioned "nut grass," seems to make cultivation necessary under our conditions.

The yields of green forage on an acre basis since 1918 follow:¹

| Variety | First Half Year, 1918 | | July, 1918-June, 1919 | |
|----------------------|---|-----------------|---|-----------------|
| | Yield in Tons Green Forage (Acre Basis) | No. of Crops | Yield in Tons Green Forage (Acre Basis) | No. of Crops |
| Peruvian | 22.13 | 4 | 33.82 | 9 |
| Kansas | 25.36 | 4 | 33.04 | 9 |
| Arabian | 27.50 | 4 | 45.80 | 9 |
| Hairy Peruvian | 29.08 | 4 | 57.75 | 8 |

The green weights given above are about four times as large as the amount of dry alfalfa hay that would result if the green forage were cured into hay.

The College Farm has several fields of alfalfa that are over three years old and are still producing well. Insect pests and plant diseases have caused no trouble, with the exception of cut-worms when the field is being established. The cost of establishing a new field in weedy ground can be materially reduced by repeated discings before planting, so as to germinate and kill as many weed seeds as possible before planting the alfalfa. The alfalfa seedlings are very delicate for the first few weeks after planting the seed, and to hand-weed an acre of alfalfa is expensive in labor costs.

CASSAVA.

Cassava cuttings were obtained from the Hawaii Federal Experiment Station and planted on March 30, 1917, in rows three and one-half feet apart with three feet between plants in the rows. The cuttings were from 8 to 12 inches long, and shoots developed within a week after planting.

The field on which the cassava was grown is very rocky and hard to cultivate, and as a result the plants received practically no cultivation, but were allowed to grow wild with whatever vegetation competed for the land.

On February 10, 1919—1 year, 10 months and 10 days after planting—the cassava roots were dug, sliced and dried, after which they were ground into a meal. The yield on an acre basis was 2225 lbs. of dried cassava meal, a very small yield, but it is of interest

¹ See First Annual Report, College of Hawaii Bulletin No. 5, for yields previous to 1918.

because it indicates what cassava will do under neglected conditions in adverse, rocky soil. The roots were about 3 feet long and 2 to 3 inches in diameter. The rocks undoubtedly greatly restricted their development. The tops were practically bare of leaves when harvested, indicating that the plants had been mature for some time. The field was never irrigated. The meal was found to be both nutritious and palatable as a feed for dairy cattle and hogs.



Diversified Agriculture on College of Hawaii Farm—Corn, Cowpeas in foreground, Alfalfa in distance.

CORN.

Several new varieties were tried on the College Farm during the last year, but only the old varieties, Cuban and Guam, produced ears. A summarized description of each corn trial follows below:

Cuban Corn.

Cuban corn, first introduced into the Territory in January, 1917, by the College of Hawaii, continues to be one of the lowland varieties adapted to Hawaii. Seed has been distributed by the College to 124 corn growers living in all parts of the Territory, and many of them have had unusual success with this corn. There have also been some failures, which are to be expected, since conditions in dif-

ferent parts of the Territory vary greatly, and conditions even in the same locality vary from year to year. The year 1918-1919 was not as favorable to corn on the lowlands of Oahu as was the season preceding this.

The following resume gives the results obtained with Cuban corn on the College of Hawaii Farm during the past year:

A field planted to Cuban corn on April 25, 1918, made a normal growth with a few occasional distorted stalks and was harvested August 25-31, 1918, an average of 123 days since planting, yielding at the rate of 26 bushels of ear corn on an acre basis.

A field planted May 2, 1918, was mature four months later and yielded at the rate of 22 bushels ear corn on an acre basis.

A field planted July 2, 1918, was harvested October 22, 1918—110 days after planting. The yield on an acre basis was 21.7 bushels of ear corn.

A field planted November 7, 1918, was harvested March 17-24, 1919—an average of 114 days since planting. This field consisted of 4.14 acres, parts of which were very good and parts of which, due to lack of sufficient moisture and adverse soil conditions, yielded practically nothing. The average for the whole field was 14.25 bushels on an acre basis.

All the above yields are low compared with the preceding year. Difficulty in getting a heavy stand, and general adverse corn conditions, seem to have been the contributing causes.

Guam Corn.

A field of Guam corn was planted December 13, 1918, and was harvested April 23, 1919—130 days after planting. The yield was 29.5 bushels on an acre basis—the best corn yield we secured on the College Farm during the past year. Corn attained a height of 5.5 feet when mature. This variety on the College Farm has a tendency to send up suckers from the base of the old plants, these suckers reaching a height of two to three feet.

New Rockdale Corn.

This is a white dent variety which was obtained from the Hastings Seed Company of Atlanta, Georgia, and planted on the College Farm, March 5, 1919. The corn made a normal growth until about two feet tall, when some plants started drying in spite of ample irrigation, and later, when many plants had attained a height of three

to six feet, the leaves became bunched at the top, with typical distorted tassels, leaning to one side. By May 24th half the stalks had entirely dried up and no ears were produced.

While this variety was a failure from the standpoint of ear production, it made a larger growth before dying than was the case with most other varieties that failed on the College of Hawaii Farm. Under normal conditions it would doubtlessly be a very tall growing variety.

Florida Flint Corn.

This variety was obtained from the Hastings Seed Company at Atlanta, Georgia, and planted on the College Farm, March 13, 1919. Six weeks later the plants had nearly all dried up, with all signs that are typical of corn failure with some varieties on the lowlands of Hawaii.

Surcropper Corn.

This seed was secured from the Ferguson Seed Farms at Sherman, Texas, and planted April 29, 1919. Six weeks later most of the plants had tassels leaning to one side, variegated leaves bunched at the top of the plants, and within two more weeks nearly all the plants were drying up—another typical corn failure.

COWPEAS.

Cowpeas have been grown with a fair degree of success during the year. The aphids continue to be the worst foe of the cowpeas, but we occasionally grow a crop where the aphids do no damage whatever.

A field of $2\frac{1}{4}$ acres planted to Taylor cowpeas October 25 and 26, 1918, had reached a height of 15 to 18 inches by the end of November, when the aphids became abundant. Early in December a severe storm whipped the plants so badly that practically every leaf and many of the stems were destroyed. The field appeared to be ruined, but one month later it had recovered wonderfully, and all the aphids were gone. A heavy rain often does wonders in ridding a field of aphids.

By January 29, 1919, the greater part of the field had been cut for forage, yielding at the rate of 4.13 tons green forage on an acre basis. This was an average of 80 days since planting.

On March 4, 1919, the balance of the field was harvested for seed,

yielding at the rate of 500 lbs. of threshed cowpeas on an acre basis. This was 128 days since planting, but the maturing time was delayed at least two weeks by the December storm.

Another field planted to Taylor cowpeas December 12, 1918, was literally covered with aphids six weeks later, and nothing remained of the plants except shrivelled stems. Having destroyed their host, the aphids disappeared, many of them drying on the apparently dead plants. After the aphids were gone the cowpeas produced a ratoon crop, which was harvested for green forage 109 days after planting and showed no signs of aphids.

A field planted to Brabham cowpeas at the same time, and adjoining the Taylor variety, was attacked by the aphids and practically destroyed, and failed to ratoon as well as did the Taylor variety.

A field planted to Taylor cowpeas February 7, 1919, produced a fine crop of green forage without any insect pests in an average of 98 days, yielding at the rate of 12.18 tons green forage on an acre basis.

Another field of Taylor cowpeas planted April 7, 1919, escaped all insect pests, and part of the field in 66 days produced green forage at the rate of 8.06 tons per acre. That part left for seed production yielded at the rate of 742 lbs. cowpeas on an acre basis, produced in 90 days. It is very noticeable that cowpeas mature much sooner in the summer than during the winter months.

VALENCIA PEANUTS.

A field planted to Valencia peanuts on December 19, 1918, made a good growth during the first three months. Then some of the leaves were destroyed by eating insects, and about 5% of the plants were dying, due to *Sclerotium rolfsii*. The plants were ready to harvest 130 days after planting, but the yield of sound peanuts was only 500 lbs. on an acre basis. Many of the pods were affected with mealy bugs, and what appeared to be small mites, grey in color. On many of the pods there were also signs of a fungus growth with yellow spore-bearing organs.

SORGHUMS.

The following varieties of sorghums are growing on the College Farm at the present time: Egyptian sorghum, Kaffir corn, Feterita, Shalla sorghum, Darso sorghum, Honey sorghum and African sorghum. None of the fields are over seven months old, and data on yearly yields of these varieties will be made in a later report.

SOY BEANS.

A small field was planted to soy beans on January 29, 1919. Part of the seed was inoculated with a culture of soy bean bacteria; the balance of the seed was not inoculated.

One month after planting, the plants were five inches tall, and the plants from inoculated seed were no better than those from the uninoculated seed.

Pods began to form at about six weeks—12-18 pods on each plant and 1-3 peas in a pod. The pods were two-thirds mature when the plants were nine weeks old, and were harvested 86 days after planting. At the time of harvesting practically all the leaves had been destroyed by Japanese beetles or slugs. There were no signs of aphids at any time. The yield was 400 lbs. of threshed soy beans on an acre basis. The plants when mature were only eight inches tall. At no time did the inoculated plants appear better than the rest. Nodules were abundant on the roots of all of the plants, largely attached to the main root right below the crown of the plant.

SUDAN GRASS (*Andropogon halepensis*).

The College Farm has a total area of 1.2 acres in sudan grass at the present time. On an acre basis this produced 39.47 tons of green forage during the fiscal year 1918-1919.



A good stand of Sudan Grass on the College Farm.

We find that green sudan is a very good forage crop to mix with green alfalfa for cattle and horses. The crop is quite immune to most pests, but must be replanted about every year to get the best yields. The above yields are on relatively new fields. In 1916 on new fields the yield was 47.49 tons, and in 1917 on the 1916 fields the yield was only 28.49 tons. All the sudan fields on the College Farm are irrigated when necessary, and the crop is grown in rows permitting cultivation.

SWEET CLOVER (*Melilotus alba*).

Sweet clover seed was planted in thirty-inch rows on January 29, 1919. One month later it had reached a height of three inches; when two months old it was about eight inches high, and seeds started forming one hundred days after planting, at which time it was cut for forage. By mixing the green sweet clover with alfalfa, we experienced no difficulty in getting the cattle to eat same. It produces ratoon crops, but not nearly as many as does alfalfa, due to its slower habits of growth. The field is still too young to give yields, but indications thus far are that alfalfa is a better crop.

UBA CANE.

Uba or Japanese cane is growing on a half-acre plot under rather adverse conditions, since present conditions make irrigation of this plot impossible. In 1917, with irrigation, it was cut five times, yielding at the rate of 29.46 tons of green forage on an acre basis; in 1918 it was cut three times, yielding 28.67 tons on an acre basis. During the first half of 1919, however, with no irrigation and only 12.87 inches of rainfall, it was cut only once, with a yield of 3.08 tons on an acre basis for the half year. In fact, during the dry months the plant made no growth, but it seems to have the property of sending out green leaves again when the rains come.

This field of Uba cane, on account of its rocky character, has received no cultivation during the past three years, and no fertilizer has been applied. Hence, all conditions were adverse, but they are cited here to show what the crop will do under neglected conditions.

CATERPILLAR TRACTOR.

A Cleveland tractor was purchased for the College of Hawaii Farm in June, 1918. The data given below refer to the first year's work of this machine, from July 1, 1918, to June 30, 1919.

The tractor is rated by the manufacturers to develop 12-20 horsepower. It was used for various kinds of work, including plowing, subsoiling, pulling a double-acting cutaway disc harrow, and to a slight extent for furnishing power for stationary machines. The fields of the College Farm are extremely rocky, and the driver was new to the work, so it must be assumed that the tractor received rather hard usage.

The nature of the work and fields were such that it is impossible to give reliable data on an acre basis. During the year the tractor was used a total of 1383 hours, and costs are calculated on an hour basis.

The tractor uses both gasoline and engine distillate. We ordinarily start the motor on gasoline and then switch to engine distillate, but due to a temporary distillate shortage in Honolulu we used gasoline exclusively for a time.

Depreciation is estimated at 25%, and it is probably more than that. Tractors are still so new that little data are available. Furthermore, the number of years that the tractor is used during the year is the big factor. Depreciation would not be nearly as great in a temperate zone locality, where tractors can be used only five or six months, as in Hawaii, where they are used the year around. The nature of the work done, as well as the skill of the driver, will also be big determining factors in arriving at a just and proper rate of depreciation.

The following items entered into the cost of operation for the year:

| | |
|---|-------------------|
| 25% depreciation on cost (\$1550.00)..... | \$ 387.50 |
| New parts and repairs..... | 177.10 |
| 1016 gallons engine distillate..... | 129.69 |
| 569 gallons gasoline | 125.71 |
| 312 hours man labor (oiling and minor repairs)..... | 93.91 |
| 6% interest on investment..... | 93.00 |
| 50 gallons motor oil..... | 30.46 |
| 1½ barrel grease | 25.63 |
| 30 gallons transmission oil..... | 24.31 |
| Total | <u>\$1,087.31</u> |

The total cost for new parts and repairs was \$177.10, and \$92.90 of this amount was for lower track wheels and bearings.

With a total of 1383 hours of work done and 1585 gallons of distillate and gasoline used, we find that the tractor used 1.14 gallons of fuel per working hour.

The cost per hour of operation for various items follows:

| | |
|--------------------------------------|--------|
| Depreciation | \$.28 |
| Fuel (distillate and gasoline) | .18 |
| New parts and repairs..... | .13 |
| Man labor (oiling, etc.) | .07 |
| Interest | .07 |
| Lubrication | .06 |
| | <hr/> |
| | \$.79 |

COST OF HORSE LABOR.

The College Farm has four work horses, which did a total of 4174 hours of work during the fiscal year; an average of about 3½ hours of work per horse for each working day of the year. The horses are valued at \$950.00; the stable and equipment at \$391.85. If the average working period of a horse is ten years, depreciation may be assumed to be about 10%, and this is also the rate of depreciation applied to the stable and equipment in these figures.

Cost per Hour of Horse Labor, College of Hawaii Farm, July 1, 1918--June 30, 1919.

| | Total Cost. | Cost per Hour. |
|---------------------------|-------------|----------------|
| Feed | \$ 762.81 | \$.183 |
| Man labor | 207.49 | .050 |
| 10% depreciation | 134.18 | .032 |
| 6% interest | 80.51 | .019 |
| Shoeing horses | 55.00 | .013 |
| Repair of harnesses | 37.73 | .009 |
| Veterinary service | 12.00 | .003 |
| | <hr/> | <hr/> |
| | \$1,289.72 | \$.309 |

COMPARISON OF COST OF TRACTOR AND HORSE LABOR ON COLLEGE OF HAWAII FARM.

Horses must be available for some kinds of work, but for heavy work we found that our tractor would do the work of four horses. An hour of tractor labor costs 79c; four horse-hours would cost \$1.24. One year's comparisons would indicate that economy favors tractor labor.

However, three factors must be considered in drawing conclusions from the above data.

1. The cost of feed for horses will vary greatly, and on planta-

tions with cane tops and molasses available would be much less than at the College Farm.

2. The tractor will undoubtedly cost more for repairs the second year, thereby increasing the cost of operating same.

3. On the College Farm one horse averaged only $3\frac{1}{2}$ hours work per day. With more hours, the cost per hour would be materially reduced.

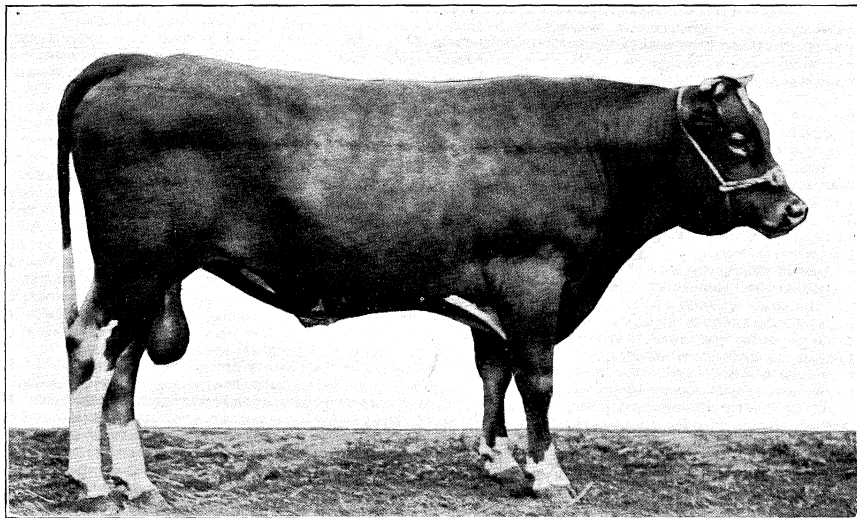
DAIRY CATTLE.

The dairy herd has been increased in size during the past year by calves born into the herd and by the purchase from A. J. Welch, at Redwood City, California, of three fine Guernsey heifers. These heifers were selected by Professor Gordon H. True of the University of California.

Advanced Registry Official Records.

Two A. R. O. records were made during the year.

At the age of 7 years, 3 months and 17 days, Kauic Manca, No. 505874, produced 366.3 lbs. of milk, containing 12.547 lbs. butter fat, in seven consecutive days.



Guernsey Bull on the College Farm—Lord Mysie's Corona Boy, No. 45786.

At the age of 5 years, 11 months and 14 days, Baby Joletta, No. 387561, produced 362.6 lbs. of milk, containing 12.039 lbs. of butter fat, in seven consecutive days.

During a four-day officially supervised butter-fat production contest at the 1919 Hawaii Fair, Kauic Manca, No. 505874, produced 192.3 lbs. milk, containing 7.14 lbs. butter fat, winning the contest by a margin of .59 lb. butter fat. This record was made four months after calving.

Cost of Feeding Dairy Cattle.

The following table gives the names and official registry numbers of the animals in the College herd, as well as the cost of the feed for the year:

**VALUE OF FEED FED TO ANIMALS IN COLLEGE OF HAWAII DAIRY,
DURING FISCAL YEAR ENDING JUNE 30, 1919.**

| Stable Nos. | Names | Registry Nos. | Born | Value of Feed for Year | Value of Feed per Day |
|----------------|---|------------------|---------------|------------------------------|-----------------------------|
| 1 | Kauie Manca | 505874 | Oct. 19, 1911 | \$ 296.63 | \$.8127 |
| 2 | Joletta | 150076 | Dec. 30, 1910 | 288.04 | .7892 |
| 3 | Baby Joletta | 387561 | Mar. 2, 1913 | 283.15 | .7757 |
| 4 | Luku | 387564 | Oct. 3, 1912 | 262.93 | .7204 |
| 5 | Joletta 2d | 387562 | Mar. 13, 1914 | 267.15 | .7320 |
| 6 | Lady of Manoa | 75916 | Nov. 28, 1912 | 255.21 | .6992 |
| 7 | Kitchener's Corona Lass | 40593 | Dec. 21, 1911 | 269.36 | .7380 |
| 8 | Joletta Korndyke | 387563 | Jul. 6, 1915 | 252.35 | .6914 |
| 9 | Manca Creamecup | 532607 | Oct. 3, 1915 | 262.20 | .7184 |
| 10 | Luku Creamecup | 411810 | Feb. 8, 1916 | 259.84 | .7120 |
| 11 | Manca Korndyke | 532608 | Oct. 10, 1916 | 235.47 | .6451 |
| 12 | Cornucopia Joletta Korn- dyke | 401441 | Jan. 28, 1917 | 223.24 | .6116 |
| 13 | Sunbeam (Grade) | | 1913 or 1914 | 233.69 | .6403 |
| 14 | Rainbow (Grade) | | Feb. 16, 1918 | 133.67 | .3662 |
| 15 | Joletta Camino Korndyke | 473580 | Oct. 3, 1918 | 135.87 | .5032 |
| 16 | | | Dec. 4, 1918 | 129.21 | .6212 |
| 17 | Manca Natoma | 517934 | Feb. 6, 1919 | 91.59 | .6360 |
| 18 | Alberta of Hidden Val- ley | 72651 | Feb. 1, 1917 | 25.46 | .5196 |
| 19 | Hidden Valley Argie Bluebell | 88230 | Jul. 26, 1918 | 29.28 | .5975 |
| 20 | Clementina of Hidden Valley | 88232 | Nov. 16, 1918 | 33.94 | .6927 |
| | Korndyke Joletta Cornu- copia ¹ | 214540 | Apr. 11, 1917 | 12.97 | .4184 |
| | Guernsey Bull ² | | Nov. 15, 1916 | 110.88 | .4047 |
| | Bull calf from No. 9†... | | Aug. 8, 1918 | 65.06 | .5043 |
| | Hawaii Camino King ⁴ ... | 256341 | Nov. 28, 1918 | 8.24 | .5493 |
| | Bull calf from No. 3‡ .. | | Feb. 16, 1919 | 18.47 | .8395 |
| | Natoma Camino Korn- dyke | 184708 | Apr. 10, 1916 | 169.54 | .4645 |
| | Lord Mysie's Corona Boy | 45786 | Mar. 26, 1917 | 183.46 | .5026 |
| | | | | \$4,536.90 | \$16.9057 |

¹ Sold July, 1918.

² Sold March 31, 1919.

† Sold December 4, 1918.

⁴ Sold December 15, 1918.

‡ Sold March 10, 1919.

COMPARISONS OF MILK PRODUCTION COSTS ON COLLEGE FARM FOR THREE YEARS.

| | 1916-1917. | 1917-1918. | 1918-1919. |
|-------------------------|------------|------------|------------|
| Quarts produced | 22,151 | 22,940 | 41,305 |
| Cost per quart for: | | | |
| Feed | \$0.0618 | \$0.08113 | \$0.1114 |
| Man labor | .0392 | .05484 | .0401 |
| Miscellaneous | .0189 | .01541 | .0123 |
| Refrigeration | .0106 | .00609 | .0043 |
| Sterilization | .0088 | .00863 | .0040 |
| Horse labor costs | .0021 | .00231 | .0028 |
| Total | \$0.1414 | \$0.16841 | \$0.1749 |

FEED COST PER QUART OF MILK.

College of Hawaii Dairy.

| Name of Cow | 1917-1918 | | | 1918-1919 | | |
|----------------------------------|----------------------------|--------------|------------------------------|----------------------------|--------------|------------------------------|
| | Lbs. Milk Pro- duced | Feed Cost | Feed Cost per Qt. Milk | Lbs. Milk Pro- duced | Feed Cost | Feed Cost per Qt. Milk |
| Kauie Manca | 8647.7 | \$147.73 | \$0.037 | 10,917.6 | \$296.63 | \$0.058 |
| Joletta | 7191.2 | 136.44 | .041 | 9,167.8 | 288.04 | .067 |
| Baby Joletta | 5672.0 | 111.85 | .042 | 8,828.4 | 283.15 | .069 |
| Luku | 6840.2 | 116.80 | .037 | 9,823.5 | 262.93 | .057 |
| Joletta 2d | 3125.6 | 139.16 | .096 | 7,799.6 | 265.19 | .073 |
| Lady of Manoa | 4387.7 | 141.47 | .069 | 6,053.9 | 257.25 | .091 |
| Kitchener's Corona Lass | 5324.0 | 147.63 | .059 | 6,283.6 | 269.36 | .092 |
| Joletta Korndyke .. | | | ... | 6,054.6 | 250.39 | .089 |
| Manca Creamcup ... | 3108.7 | 111.64 | .077 | 6,493.4 | 262.05 | .087 |
| Luku Creamcup | | | ... | 7,030.0 | 259.84 | .079 |
| Manca Korndyke ... | | | ... | 6,165.4 | 235.47 | .082 |
| Sunbeam (Grade) ... | 5465.7 | 111.47 | .044 | 3,988.3 | 233.69 | .126 |
| Average | 5529.1 | \$129.35 | \$0.051 | 7,383.8 | \$263.66 | \$0.080 |

YEARLY MILK PRODUCTION RECORDS SINCE 1912.
College of Hawaii Dairy.
July 1-June 30.

| Name | Born | Date First Calf | 1912-1913 Lbs. Milk | 1913-1914 Lbs. Milk | 1914-1915 Lbs. Milk | 1915-1916 Lbs. Milk | 1916-1917 Lbs. Milk | 1917-1918 Lbs. Milk | 1918-1919 Lbs. Milk |
|-------------------------|---------------|--------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Holsteins | | | | | | | | | |
| Kaie Manca..... | Oct. 19, 1911 | Aug. 14, 1913 | | 5,832.5 | 8,374.6 | 9,271.0 | 11,693.6 | 8,646.7 | 10,917.6 |
| Joletta..... | Dec. 30, 1910 | Mar. 2, 1913 | | 6,329.4 | 4,048.2 | 10,358.6 | 4,770.1 | 7,191.2 | 9,167.8 |
| Luku..... | Oct. 3, 1912 | May 28, 1914 | | 762.4 | 5,933.8 | 6,032.8 | 7,553.6 | 6,840.2 | 10,023.5 |
| Baby Joletta..... | Mar. 2, 1913 | Dec. 2, 1914 | | | 3,372.4 | 6,056.7 | 6,553.7 | 5,672.0 | 8,828.4 |
| Joletta 2d..... | Mar. 13, 1914 | Jan. 28, 1917 | | | | | 4,360.9 | 3,125.6 | 7,799.6 |
| Manca Creamcup..... | Oct. 3, 1915 | July 4, 1917 | | | | | | 3,108.7 | 6,493.4 |
| Sunbeam (grade)..... | 1913 or 1914 | July 26, 1917* | | | | | | 5,465.7 | 3,988.1 |
| Joletta Korndyke..... | July 6, 1915 | Sept. 28, 1918 | | | | | | 6,054.6 | 7,030.0 |
| Luku Creamcup..... | Feb. 8, 1916 | Aug. 24, 1918 | | | | | | | 6,165.4 |
| Manca Korndyke..... | Oct. 10, 1916 | Dec. 7, 1918 | | | | | | | |
| Guernseys | | | | | | | | | |
| Kitchener's Corona Lass | Dec. 21, 1911 | Feb. 7, 1915 | | | 3,352.3 | 6,671.6 | 4,759.8 | 5,324.0 | 6,283.6 |
| Lady of Manoa..... | Nov. 28, 1912 | Nov. 17, 1916 | | | | | 4,596.7 | 4,387.7 | 6,053.9 |

* Purchased.

CASSAVA MEAL AS A FEED FOR DAIRY CATTLE.

The cassava meal used in this feeding test was secured from Grove Farm, Lihue, Kauai, through the courtesy of the manager, Mr. E. H. W. Broadbent. It was prepared by slicing and drying the cassava roots and then grinding to a coarse flour, in which form it seemingly keeps indefinitely.

The cassava meal was gradually substituted for part of the other concentrates, beginning February 21, 1919, and continued in different proportions to June 1, 1919. The test naturally divides itself into four periods, with the following concentrates fed daily during each period:

| | |
|---|--|
| First Period: January 22-February 20, 1919, inclusive (30 days). | <div> <div>5.2 lbs. cracked corn</div> <div>5.2 lbs. Brewer's grains</div> <div>2.6 lbs. cocoanut meal</div> <hr/> <div>13.0 lbs. daily</div> </div> |
| Second Period: February 21-April 30, 1919, inclusive (69 days). | <div> <div>7.0 lbs. Brewer's grains</div> <div>10.0 lbs. cassava meal</div> <div>.5 lb. linseed oil cake meal</div> <hr/> <div>17.5 lbs. daily</div> </div> |
| Third Period: May 1-May 31, 1919, inclusive (31 days). | <div> <div>4.0 lbs. cracked corn</div> <div>4.0 lbs. Brewer's grains</div> <div>2.0 lbs. cocoanut meal</div> <div>8.0 lbs. cassava meal</div> <div>1.0 lb. linseed oil cake meal</div> <hr/> <div>19.0 lbs. daily</div> </div> |
| Fourth Period: June 1-June 30, 1919, inclusive (30 days). | <div> <div>7.2 lbs. cracked corn</div> <div>7.2 lbs. Brewer's grains</div> <div>3.6 lbs. cocoanut meal</div> <div>1.0 lb. linseed oil cake meal</div> <hr/> <div>19.0 lbs. daily</div> </div> |

The daily roughage was approximately the same during the whole time, and consisted of:

20-30 lbs. green alfalfa,
 20 lbs. green sudan,
 20-40 lbs. green cowpea vines, green corn fodder, green sweet potato vines, or green forage sorghums.

The cow under test was a Holstein—Joletta 2nd—No. 387562, born March 13, 1914. Her last calf was dropped October 3, 1918. The

following tabulation shows the essential facts about her production and the cost of the concentrated feeds during the different periods mentioned above:

| | No. of days in period | Daily cost of concentrated feed ¹ | Lbs. milk daily | Concentrates. Cost per lb. of milk |
|--------------------|--------------------------|---|--------------------|--|
| First Period..... | 30 | \$0.442 | 29.8 | \$0.0148 |
| Second Period..... | 69 | 0.461 | 31.4 | 0.0147 |
| Third Period..... | 31 | 0.550 | 32.3 | 0.0170 |
| Fourth Period..... | 30 | 0.662 | 30.2 | 0.0219 |

¹ Cassava meal is too new in the Territory to have a standardized price. In this test it was valued at 2c per lb., and other concentrates at their actual market value.

CONCLUSIONS.

1. The fact that a cow's milk production normally decreases from the beginning to the end of the lactation period is a big factor in every feeding test with dairy cattle, and must be considered in this case.
2. The increase in milk flow during the second and third periods is probably due to the increasing amounts of concentrates that were fed. However, the fact that cassava meal can be substituted in part for corn and cocoanut meal is significant.
3. Cassava meal proved very palatable.

A PECULIAR VARIATION IN THE PERCENT OF FAT IN A COW'S MILK.

Joletta is a registered Holstein-Friesian cow (No. 150076), born December 30, 1910. Three months after she had dropped her fourth calf she was fed heavier than usual and milked three times per day, hoping to stimulate production to a point where she would make a record large enough to admit her into the Advanced Registry class.

The following table shows the unusually low percentages of fat found in her milk:

| | Lbs. Milk | % Fat | Lbs. Fat |
|--------------|-----------|-------|----------|
| June 28..... | 52.0 | 1.35 | .702 |
| “ 29..... | 49.3 | 1.40 | .690 |
| “ 30..... | 50.4 | 1.60 | .806 |
| July 1..... | 52.2 | 1.00 | .520 |
| “ 2..... | 55.0 | 1.15 | .632 |
| “ 3..... | 49.4 | 1.30 | .642 |
| “ 4..... | 45.4 | 1.20 | .545 |
| “ 5..... | 44.5 | 1.75 | .779 |
| “ 6(*)..... | 37.0 | 2.10 | .777 |
| “ 7..... | 36.0 | 2.80 | 1.008 |
| “ 8..... | 37.8 | 2.35 | .888 |
| “ 9..... | 38.8 | 2.60 | 1.008 |
| “ 10..... | 42.5 | 3.40 | 1.445 |
| “ 11..... | 43.0 | 2.80 | 1.204 |
| “ 12..... | 40.8 | 2.75 | 1.122 |
| “ 13..... | 37.4 | 4.00 | 1.496 |
| “ 14..... | 34.7 | 3.50 | 1.214 |
| “ 15..... | 39.4 | 3.55 | 1.398 |
| “ 16..... | 37.2 | 3.40 | 1.265 |

* Began milking twice per day again.

The specific gravity of the milk ranged from 1.0334 to 1.0349, a trifle high, but about what would be expected from the percentage of fat found in the milk.

She showed no signs of illness, and consumed the following feed daily:

30 lbs. green alfalfa,
 10 lbs. green sorghum,
 10 lbs. green sudan grass,
 12 lbs. grain mixture,
 8 lbs. beet pulp.

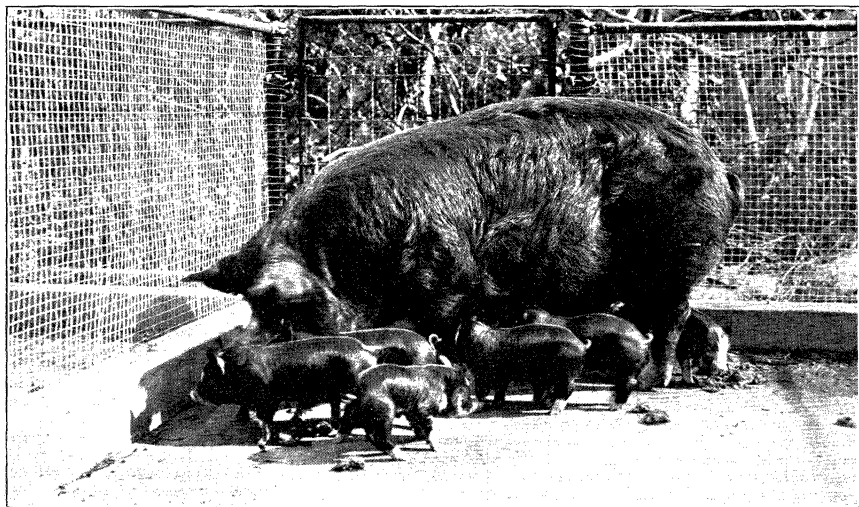
It is noticeable that the fat content began to increase on the day the milking periods were reduced to two in number, but that does not necessarily have any significance. The tests of Joletta's milk over a long period average a little over 3% fat. At one milking, during a later period, while she was being milked three times a day, the fat content dropped to 2.25% butterfat.

SWINE.

At the close of the year included in this report, the College Farm had the following swine:

One mature Tamworth boar,
Three mature Tamworth sows,
Three Tamworth pigs,
One Tamworth litter,
One mature Berkshire boar,
Three mature Berkshire sows,
One young Berkshire boar,
One Berkshire litter.

During the last quarter of 1918 a Student Army Training Corps had their headquarters at the College of Hawaii and the slops from the kitchen were fed to the hogs on the farm with great success. No system of grain feeds that we have tried compares with the slops for producing rapid, economical gains, and wherever slops are available they should be utilized to the utmost as a hog feed.



Berkshire Sow with Litter on College Farm.

HOG-FEEDING EXPERIMENTS WITH A SELF-FEEDER.**I.****Sweet Potatoes versus Cassava Meal.**

The self-feeder is well enough known that a detailed description of same is unnecessary in this account. Briefly, it is a hopper arrangement, and as the hogs eat the feed, more runs down, keeping a constant supply of feed before the hogs at all times. As many different kinds of feed can be given to the hogs as there are compartments in the self-feeder. This enables the hogs to select their feed and eat as much of same as they like—the only limit being the number of feeds that are placed in the self-feeder. In this way the hog literally selects his own ration.

Nine hogs born November 15th and January 1st, respectively, were divided into three equal lots on March 19, 1919. Number one lot was given access to sweet potatoes supplemented with tankage and oil cake meal, and a definite amount of green alfalfa each day. Number three lot had the same feeds except that cassava meal was substituted in place of sweet potatoes. Number two lot was given access to nine different feeds, somewhat distinct from the sweet potato versus cassava meal test, so this will be described later.

The test was started March 19th and continued to May 29, 1919—a period of seventy days. During this period the hogs were weighed once each week. The cassava meal was obtained through the courtesy of Mr. E. H. W. Broadbent, manager of Grove Farm Plantation, at Lihue, Kauai. The alfalfa, corn, sweet potatoes and some of the cassava were grown on the College of Hawaii Farm. Other feeds were purchased.

Several things happened during the progress of the test which affected the final results somewhat. Hog number 2, in lot one, died after the experiment had been in progress twelve days, in the meantime having consumed an unknown quantity of feed which should properly not be charged against the two remaining pigs in the lot, but this seems more than compensated for by hog number 1, in lot three, which gained only nine pounds during the whole period.

It is believed that the values assigned to sweet potatoes and cassava meal are low rather than too high. The sweet potatoes were dug every few days, cut in a root slicer, and fed. The cassava meal was made by slicing the cassava roots, drying them, and then grinding to a coarse meal.

The amounts of the different feeds that were eaten during the first and last half of the experiment are listed separately, thinking that it might show whether hogs acquire a fondness for feeds which may be unpalatable to them at the beginning.

LOT ONE.

Alfalfa, Sweet Potatoes, Tankage and Linseed Oil Cake Meal.

| | | | |
|------------------------|---------|---------|----------------|
| Number of hog | 32 | 5 | 2 |
| Sex | Sow | Sow | Boar |
| From sow number | 17 | 36 | 21 |
| Weight March 19th..... | 69 lbs. | 40 lbs. | 30 lbs. |
| Weight May 29th..... | 115 " | 65 " | Died Mar. 31st |
| Gain | 46 " | 25 " | |

Average gain per hog per day: .507 lb.

FEED CONSUMED.

| | First Half, Pounds | Last Half, Pounds | Total, Pounds | Rate per Ton | Cost |
|-------------------------|--------------------------|-------------------------|------------------|-----------------|---------|
| Sweet potatoes | 273 | 195 | 468 | \$ 20.00 | \$ 4.68 |
| Linseed oil cake meal.. | 40 | 44 | 84 | 97.50 | 4.10 |
| Tankage | 20 | 42 | 62 | 120.00 | 3.72 |
| Green alfalfa | 700 | 700 | 1400 | 10.00 | 7.00 |
| Total cost | ... | ... | ... | | \$19.50 |

Feed cost per pound gain: \$.0274.

Pounds feed for one pound gain (excepting alfalfa): 8.6 lbs.

LOT THREE.

Alfalfa, Cassava Meal, Tankage and Linseed Oil Cake Meal.

| | | | |
|------------------------|---------|---------|---------|
| Number of hog | 31 | 30 | 1 |
| Sex | Boar | Boar | Boar |
| From sow number | 36 | 36 | 21 |
| Weight March 19th..... | 50 lbs. | 50 lbs. | 41 lbs. |
| Weight May 29th..... | 101 " | 74 " | 50 " |
| Gain | 51 " | 24 " | 9 " |

Average gain per hog per day: .40 lb.

FEED CONSUMED.

| | First Half, Pounds | Last Half, Pounds | Total, Pounds | Rate per Ton | Cost |
|--------------------------|--------------------------|-------------------------|------------------|-----------------|---------|
| Cassava meal | 160 | 140 | 300 | \$ 40.00 | \$ 6.00 |
| Linseed oil cake meal... | 40 | 30 | 70 | 97.50 | 3.41 |
| Tankage | 20 | 2 | 22 | 120.00 | 1.32 |
| Green alfalfa | 700 | 700 | 1400 | 10.00 | 7.00 |
| Total cost | ... | ... | | | \$17.73 |

Feed cost per pound gain: \$.0211.

Pounds feed for one pound gain (excepting alfalfa): 4.6 lbs.

CONCLUSIONS.

1. The sweet-potato-fed hogs selected a ration consisting of 76% sweet potatoes, 14% oil cake meal, and 10% tankage, and when supplemented with green alfalfa this produced one pound of gain for every 8.6 lbs. of the mixture consumed.

2. The cassava-meal-fed hogs selected a ration consisting of 76% cassava meal, 18% oil-cake meal, and 6% tankage, and when supplemented with green alfalfa this produced one pound of gain for every 4.6 lbs. of the mixture consumed.

3. 100 lbs. of cassava meal seem to be equal to about 183 lbs. of undried sweet potato roots in feeding value.

4. The relative value of sweet potatoes and cassava as hog feeds will depend entirely on the quantity of each that can be grown on a given area in a given time.

5. Hogs prefer oil-cake meal to tankage.

6. Sweet potatoes and cassava meal are both good hog feeds, but the high cost of gains in these pen-fed lots indicates that, for real profits, the crops should be hogged-off.

HOG-FEEDING EXPERIMENTS WITH A SELF-FEEDER.

II.

Feeds Selected by Hogs.

To determine which feeds hogs preferred, Lot 2, consisting of three 3-months-old Berkshires, were given access to two self-feeders containing a total of nine different feeds. The conditions of the experiment were such that they could at all times eat any or all of

the nine feeds provided. A constant supply was kept in the hoppers, which automatically fed the troughs below. A definite amount of green alfalfa was provided every day.

The amounts of the different feeds that were eaten during the first and last half of the experiment are listed separately, thinking that it may add some data to the question of whether hogs acquire a fondness for feeds which may be unpalatable to them at the beginning. The test was continued seventy days, from March 19th to May 29th, 1919. The quantities of feed consumed in pounds and percentages are listed in the table below:

| | First Half | Last Half | Total Pounds | Percent of Total Feed |
|----------------------------|---------------|--------------|-----------------|-----------------------------|
| Sweet potatoes..... | 233 | 150 | 383 | 38 |
| Cassava meal..... | 121 | 96 | 217 | 22 |
| Rolled barley..... | 50 | 60 | 110 | 11 |
| Corn..... | 40 | 50 | 90 | 9 |
| Algaroba meal..... | 40 | 30 | 70 | 7 |
| Rice bran..... | 20 | 20 | 40 | 4 |
| Wheat middlings..... | 20 | 12 | 32 | 3 |
| Linseed oil cake meal..... | 15 | 15 | 30 | 3 |
| Tankage..... | 10 | 15 | 25 | 3 |

Some interesting deductions that can be made from this experiment are that:

1. Hogs will eat local tropical crops, like sweet potatoes and cassava meal, in large quantities, and in preference to high-priced imported feeds like rolled barley and wheat middlings.
2. Rolled barley seems more palatable to hogs than corn.
3. Algaroba meal proved more palatable than rice bran.

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THE COLLEGE OF HAWAII

By Act of the 1919 Legislature is to become in 1920

THE UNIVERSITY OF HAWAII.

The charter of **The University of Hawaii** provides for the establishment of two colleges within the university in 1920, and others in the future as the need arises. These two are the **College of Applied Science** and the **College of Arts and Sciences**.

The College of Applied Science will offer courses in Agriculture, Engineering, Sugar Technology, Home Economics, and Business and Commerce. **The College of Arts and Sciences** will offer a broad range of subjects in literature, languages, art and the sciences. The former college will grant the Bachelor of Science degree and the latter the Bachelor of Arts degree.

Tuition is free to residents of this Territory. Special short courses are offered in certain lines.

For further information concerning the courses of study in this institution send for the 1920 catalog.

Kroeck Paper